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SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE

Human Atoms

See Page 131

A SCIENCE SERVICE PUBLICATION

MEDICINE

In Pavlov's Brainsteps

At Geneva, Soviet scientists report using radioactive materials to study the production of digestive juices and bile compounds, which figured in Pavlov's famous experiments.

By WATSON and HELEN DAVIS

➤ FOLLOWING IN the brainsteps of the great pre-Communist Russian, Pavlov, present-day Soviet scientists are probing the secrets of the brain and digestion with the use of exploding atomic isotopes, without surgical techniques.

The International Conference on the Peaceful Uses of Atomic Energy at Geneva was told that gray matter of the brain has greater activity as measured by protein renewal than less complex portions of the nervous system.

Dr. A. V. Palladin of the biochemical institute of the Ukrainian Academy of Sciences, Kiev, reported that the cortex, or gray matter, has the highest content of protein and uses it most intensely. The gray matter is not only the least simple part of the brain, but it evolved most recently in the animal's nervous system during the long ages of the rise of animals up the tree of life. The tracer used was radioactive sulfur isotope 35.

Research by Prof. E. M. Kreps of Leningrad has shown that there is enhanced activity in the centers of sight and sound in the brain.

Digestion and bodily functions, in the exploration of which Pavlov pioneered, have taken on a radioactive look. Soviet scientists K. S. Zamychkina and D. E. Grodsensky used radiophosphorus in tracing production of digestive juices and bile compounds, which figured in the early physiological studies by Pavlov on dogs.

Dr. Frank J. Dixon, head of the department of pathology of the University of Pittsburgh, told the conference that radioactive isotopes are showing how the antibodies, which protect the body against foreign invaders, are formed and lost. The rise of antigens which trigger the formation of the protecting substances during an infection can be followed by radioactive sulfur stuck into their molecules.

By feeding radioactive iodine to calves and then holding a Geiger counter over the thyroid glands to which this chemical travels, farmers of the future will be able to predict future milk production and tell how well the animals will stand hot summer weather, Drs. Clifton Blincoe and Samuel Brody of the University of Missouri told the conference.

With iodine 131, they have shown that a decline in thyroid activity occurs with rising temperatures above 80 degrees Fahrenheit. This makes the cows eat less and produce less milk.

Zebu cattle are less affected by high temperatures than Jersey and Holstein cattle. The smaller Jersey cows are more heat tolerant than the larger Holstein cows.

Fat Man Problem

➤ THE PROBLEM of the fat man was considered by Drs. B. Shapiro and G. Rose of Hadassah Medical School, Israel.

They reported the discovery that fat synthesis proceeds even in adipose tissue, ordinarily regarded as a mere depository of fat.

Due to its large mass, fat tissue is probably the body's most important site for making and using fat, exceeding even the liver. Their studies showing this were made with radiocarbon labeled compounds traced through the body, pinpointing the sites of fat synthesis.

Radiation Dangers

➤ A "CRASH" PROGRAM that might extend for a decade is needed to tell whether the future of the human race is being endangered by the low level of of atomic radiation now building up in the world, even without H- and A-bombs exploded in war.

Dr. T. C. Carter, of Britain's Medical Research Council and Atomic Energy Establishment, said scientists know far too little about the structure of human populations and the inducing of changes in human heredity due to radiation.

"We know enough to be apprehensive about the genetic dangers," he said, in urging a very lavish international research program be set up to discover what the world's stream of life faces in the atom.

In the civilized world, Dr. Carter said, the idea is accepted that it is permissible to do harm to a few individuals when this is the unavoidable by-product of doing good to many. For example, airlines are operated and automobiles are used even though some people are killed as a result. In these cases, however, a person has a free choice whether to expose himself to the risk.

In the case of peacetime use of nuclear power, there is no possibility of choice on the part of individuals as to whether they expose themselves to radiations that may affect their children and their children's children. The unlucky individual who suffers the genetic damage is not the one who exposed himself voluntarily to the risk.

Dr. Carter wants an extension of fundamental studies of mutations; or sudden genetic changes in the germ cells, due to radiation. This needs to be done over long periods, considering very low doses of radiation.

What the scientists call "genetic death," or the disappearance of a family tree, is not well understood. Is it due to sterility, not wanting to have children, inability to attract a mate, susceptibility to infection or accident? Is it associated with mental defect and does it put a burden on the community through hospitals and prisons? Or is the price of being a Beethoven or a Newton likely to be genetic death?

Dr. Carter wants these questions answered along with the discovery of what the debris of atomic plants and bombs will do to the future human populations.

Reasoning from what happens in mice to what can affect man, Dr. E. L. Russell of the U. S. Oak Ridge National Laboratory warned that there may be danger to the immediate offspring of atomic energy workers even with the low weekly dose of radiation now allowed.

A total accumulated dose limit may have to be established to prevent defects in even the first generation. The scientists have been most worried heretofore by the effect on future generations through hereditary defects that hide in a person's children and appear in their descendants.

Dr. Russell's mouse experiments some months ago alarmed atomic energy operators when it was shown that animals get about ten times as much genetic damage out of radiation as do fruit flies upon which earlier estimates were based.

For flowers and other plants, radiation may be useful for producing new varieties. A team of scientists from Brookhaven National Laboratory told how white carnations were turned into a permanently red variety through heavy doses of radiation.

Dr. Knut Mikaelsen of Norway found that chronic gamma radiation produced white spots on petals of red carnations. But as severe radiation is damaging or lethal for man, so does too much radiation stop or distort plant growth, changing flowers to leaves or mussing up the processes of the plant.

Fighting Disease

➤ RADIATION TREATMENT can make the germs that cause dangerous African sleeping sickness non-infectious, Dr. Dale Jenkins of the National Research Council reported.

Describing this and other uses of both atomic and other radiation for rendering harmful insects harmless, he said that radioactive polonium, selenium and antimony have been studied as possible weapons for controlling worm parasites.

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• RADIO

Saturday, Sept. 3, 1955, 5:00-5:15 p.m.

"Adventures in Science" with Watson Davis, director of Science Service, over the CBS Radio Network. Check your local CBS station.

Sir George Allen, secretary, British Association for the Advancement of Science, Bristol, England, will discuss the British Association for the Advancement of Science meeting at Bristol.

PHYSICS

Reactor Ashes Precious

Atomic plants do not pose the "disposal" problem that many laymen often think. The problem is really how to save the highly valuable "ashes" or fission products for use.

See Front Cover

By WATSON and HELEN DAVIS

➤ FIRE which mankind has used for at least 25,000 years, has unfitted people for understanding the problems of atomic energy.

Fire produces heat, and so does fission, but the results of the two process beyond that do not correspond. Nuclear fuels do not burn out as coal does. Fission products have nothing in common with ashes.

Radioactive elements withdrawn from atomic reactors are materials of perhaps as great value as the atomic fuel producing them. Disposal by burying them in the ground or throwing them into the sea just to get rid of them would be economically disastrous.

Fear of the health hazard from radiation has so far created a demand by people unacquainted with the specific problems of radioactive waste disposal that such wastes be eliminated at all costs.

To the men who have tamed the atom during the past ten years, the lifetime of the new atomic age, the problem of waste disposal appears only as that of finding enough unused space in the world to set aside the most dangerous of these products until they can be safely mined for the useful elements they contain. Fifty years would perhaps be the right time to let the hottest radiations die away.

Remove Vicious Elements

One scheme for successive steps in making use of high energy fission products was offered the International Conference on the Peaceful Uses of Atomic Energy in Geneva by Dr. E. Glueckauf of the British Atomic Energy Research Establishment, Harwell. First step in this scheme, after reducing the bulk of the fission product solution by evaporation, is to remove chemically the two most vicious radioactive elements, strontium and cesium isotopes.

Strontium is a chemical relative of calcium, the clay-forming element, and cesium is a heavier and more active relative of sodium and potassium, the universally occuring salt-formers. These two elements lend themselves to disposal by incorporating them into baked clay products.

The liquid left over after removal of strontium and cesium would be stored for 13 years, according to Dr. Glueckauf's scheme, while the clay products containing the highly radioactive material would be useful for the energy they give off.

Strontium would go into these hot bricks at once, and be used as a source of heat for 50 years. Its radiations are such that a great deal of shielding is not required to protect people working near such a source of heat.

Cesium, on the other hand, would be kept in another form for 50 years, to make use of the active rays it would give off. Only after these had died away at the end of that time, would it be given the baked clay treatment, in order that it might safely be thrown away.

After 13 years, the solution from which strontium and cesium had been extracted would again be processed for recovery of other elements, this time the rare metals ruthenium, rhodium and palladium. These are junior members of the platinum family, and find use because they are hard and not easily corroded.

Ruthenium is at present giving difficulty to researchers because its chemical properties make it troublesome to separate and its radioactive properties dangerous to handle. These difficulties are expected to be solved as more experience is gained.

An aged solution of debris from atomic reactors would also be a source of technetium, an element that does not occur in nature, but is known only in its radioactive forms, one of which is produced in the fission of uranium 235 and plutonium.

Substantial quantities of neptunium and americium from atomic reactors could also probably be used. Both neptunium and americium are artificially produced elements, heavier than uranium, not found in nature.

Value received from these semi-precious metals plus the energy used as heat and radiation from the hot products first separated will pay the costs of fission product processing, according to estimates by Dr. Glueckauf.

Figuring the Cost

Differences in ways of counting costs in nuclear energy operations were stressed by Drs. Abel Wolman and A. E. Gorman of the U.S. Atomic Energy Commission at the conference. While cost of storage of fission products might be high compared with the storage of innocuous liquids in more familiar processes, the actual money outlay for this necessary part of the atomic industrial cycle may be only a small fraction of the cost per kilowatt of electric current produced.

In counting costs, it must not be forgotten that the greater part of most industrial processes consists of obtaining usable energy in the form of heat.

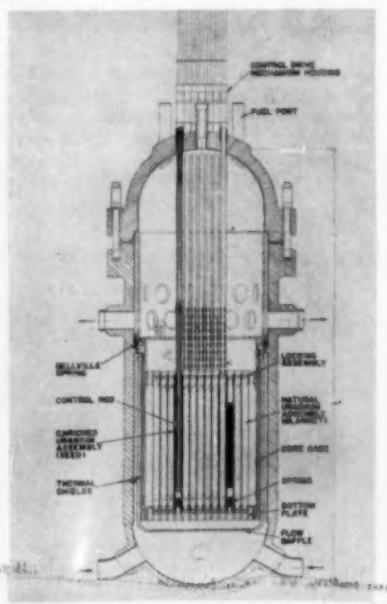
Until discovery of radioactive processes, this was the only form of energy generally used to change the form of materials to make useful products. But the radiations given off by atomic reactions can also be used in manufacturing processes.

Great advantage of the new types of reactors using circulating liquid fuel is that they allow access to the high radioactivity of the very short-lived fission products.

Energy from such radioactivity can produce new kinds of chemical reactions. One such reaction is the polymerization of plastics by irradiation, producing materials of much greater strength than the original had. Prospects of opening whole new fields of chemical research are foreseen by manufacturers alert to the possibilities of the atomic age.

Although new technologies will have to deal with new difficulties, Dr. Glueckauf is optimistic about man's abilities to deal with them.

When plutonium abandons its role as the bomb element and joins its parent uranium in peaceful industry, for example, the amount of americium that will appear in the fission products will create a serious disposal problem for the future. This



REACTOR VESSEL—The "atomic furnace" for the first U.S. atomic-powered electric generating station to be installed at Shippingport, Pa., is shown in this cutaway drawing.

deadly man-made element, No. 95 on the chemist's list, has a half-life of 470 years and will be difficult to store until it decays to a level at which it may be given final burial. However, Dr. Glueckauf stated that these problems of the future "will be solved by only a small fraction of the ingenuity that created them."

Shorter Time Slices

➤ TIME IS being sliced thinly to parts of a billionth of a second in the latest sort of atomic counters, Dr. G. A. Morton of the Radio Corporation of America laboratories, Camden, N. J., told the conference.

Scintilation counters have been developed into rugged and reliable tools for uranium prospecting and for following the course of tell-tale radioisotope tracers in biological, medical and industrial processes. The device is useful in detecting and measuring with high accuracy all forms of nuclear radiation.

When a particle is absorbed in a transparent phosphor material, a flash of light proportional to the energy of the particle is produced. This light goes into a photomultiplier tube and produces a pulse of electrical current that can be measured and recorded.

Sensitive detection devices for atomic radiation will allow keeping tab on great masses of industrial materials.

Dr. W. H. Johnson, Purdue University chemist, suggested that new measurement techniques will allow tagging vast quantities of oil in underground storage to tell of any leaks.

All the world's sugar could be labeled with such a small amount of radioactive carbon that it could be traced and yet not raise the level of the world's natural radioactive carbon activity by more than a tenth of a percent. This would allow tracking all sugar in medical experiments, but would not cause worry about sweetening food.

See Simpler Universe

➤ SIMPLIFICATION of the structure of the universe was forecast by Dr. Hans Bethe of Cornell University, Ithaca, N. Y.

Dr. Bethe said it was likely that an entirely satisfactory theory of nuclear forces could be built based only on pi mesons. Dr. Bethe, a theoretical physicist who was instrumental in the Los Alamos atomic bomb work, worked out in pre-A-bomb days the equations for the famous "carbon-cycle" by which the sun is stoked.

He said scientists do not now understand what role the mu meson plays in cementing [illegible] Although this atomic particle, found with either a positive or negative charge, has been known since 1937, it is not clear why such a particle should exist at all.

On the basis of scientists' present understanding of nuclear forces, a satisfactory theory of nuclear structure can be constructed using only protons, neutrons, electrons, neutrinos and pi mesons. There seems to be no spot for mu mesons, yet they exist.

Both mu and pi mesons are relatively lightweight, sub-atomic particles having masses lying between electrons and protons. Pi mesons are somewhat heavier than mu mesons.

Physicists who are now struggling to make sense out of about 20 atomic particles, called fundamental even though they exist for only fleeting microseconds (see SNL, May 21, p. 330), welcomed Dr. Bethe's forecast of simplification in nuclear theory.

One of the sessions of the United Nations International Conference on the Peaceful Uses of Atomic Energy which closed on Aug. 20 at Geneva is shown on the cover of this week's SCIENCE NEWS LETTER. The U.S. delegation is seated in the lower left in the photograph.

Atomic Ore From Granite

➤ IMMENSE QUANTITIES of uranium and thorium, the two chief natural elements from which atomic energy is derived, are dispersed in the ordinary granites of the earth's crust.

They can be extracted "extremely easily" according to a paper reporting the work of a team of scientists directed by Dr. Harrison Brown, professor of geochemistry at the California Institute of Technology and a technical adviser to the conference.

Although thorium and uranium are present in average granite to the extent of only a few parts per million, it has been found they are present in such a way as to make their extraction quite simple.

Average granite, found in all parts of the world, contains about four parts per million of thorium. If all the uranium and thorium could be extracted from one ton of granite and converted into fissionable material and "burned" in a nuclear reactor, the energy released would be equal to that obtained from burning about 50 tons of coal, according to the estimates of the researchers.

Experiments indicate that an average of only about 25% of the thorium and uranium in granite rock is "leachable." One ton of granite would, therefore, produce releasable energy equivalent to 10 to 15 tons of coal.

The authors point out that world-wide demand for uranium and thorium may eventually amount to "millions of tons," and they ask, "is it within the realm of technological and economic feasibility for [illegible] deposits to obtain uranium from substances which exist abundantly on the earth's surface?"

The authors show that the energy costs required to process a ton of granite, leaching uranium and thorium, would lie "within the range of 25 to 48 pounds of coal." This, they say, "is clearly very much smaller than the equivalents of 20,000 pounds of coal which could be extracted from a ton of average rock."

The authors conclude that from "solely an energetic point of view" granite rocks in the earth's crust can be processed for a net energy profit" and this means, they go on to say, that "reserves of uranium and thorium available to man can be considered for all practical purposes as infinite."

But from the economical aspect, the dollar cost of extracting uranium and thorium from granite is prohibitive at the present time. For the future, however, "there is ample uranium and thorium in igneous rocks to power a highly industrialized world economy for a very long period."

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BIOCHEMISTRY

Green Plant Secret Sought

Both U. S. and U.S.S.R. seek nature's secret, photosynthesis. If and when scientists solve the puzzle, synthetic production of food might be possible.

➤ CARBON 14, radioactive form of the fundamental life element, is being used by both Russian and American scientists to force nature to part with the secret of photosynthesis.

The still unsolved problem of how plants build complex chemicals, the world's basis for all food supplies, is potentially a greater research goal than the problem of how to use atomic energy, the prime topic of the International Conference on the Peaceful Uses of Atomic Energy in Geneva.

Russian scientists T. N. Godnev and A. A. Shlik stressed the early stages in the formation of chlorophyll, the green pigment that houses the plant's secret food factory. By keeping plants in an atmosphere of carbon dioxide made of radioactive carbon, the Russian scientists were able to measure the rate of the plant's use of carbon atoms and to calculate that the average length of life of a molecule of chlorophyll is approximately 19 days.

The dawn of a technology that may provide future generations with food aplenty was foreshadowed by two University of California scientists who said they have completely illuminated one of the two major phases of photosynthesis.

They have discovered a new and unique enzyme chemical playing a part in the first, key step in the photosynthetic cycle.

The scientists described every step of the complex chemical cycle that begins when plants absorb sunlight, carbon dioxide and water; and ends when these simple ingredients are turned into sugars, starches and other energy foods.

A "Handle," Carbon 14

When Hiroshima was cremated, this chemical cycle was almost a complete mystery. And there was no way scientists could substantially penetrate the dark mystery surrounding the subtle reactions.

But when World War II ended, American scientists were given a wonderful "handle" on the mystery, carbon 14.

Dr. Melvin Calvin of the University of California and his associates put single-celled marine plants into test tubes, gave them water, and exposed them to light and radioactive carbon dioxide. Then they killed batches of plants at different intervals—ranging from a fraction of a second up to hours.

After tearing the plants apart chemically and isolating each chemical compound, the scientists located the radioactive carbon by means of its radioactivity. By a process of deduction, they traced the radioactive carbon from one step to another all through the cycle, eventually determining the nature of each reaction.

Dr. Calvin, whose collaborator on the technical paper is Dr. J. A. Bassham, described each step in the cycle. There are 11 distinct (enzymatic) steps in which at least eight different enzymes participate. There are 11 intermediate compounds between the plant's intake of the simple ingredients and the formation of the energy compounds. (See SNL, Aug. 13, p. 101.)

The cycle in which these steps are arranged is like a flow pattern of a great assembly-line factory. The simple materials enter, they are moved along, changed and added to by enzymes and high-energy phosphate compounds.

Ironically, the first, key step in the cycle was the most difficult and the last one bared by the Bergeley researchers. Only recently have they been able to confirm the true nature of this reaction.

Isolate New Enzyme

In the process of exposing this key chemical reaction, the scientists isolated a brand new enzyme, carboxydismutase. It is the only unique enzyme in the photosynthetic cycle. All of the others are common ones found elsewhere in biological systems.

The two scientists indicated that the great remaining challenge of photosynthesis research is the determination of how sunlight is converted into the form of energy required to operate the chemical cycle. Years ago scientists determined that sunlight is captured by chlorophyll, the green pigment of the plant cell. But how it is converted remains a great mystery, and one that does not yield readily to study with radioactive isotopes.

Two possibilities for application are indicated:

First, it may be possible to use the knowledge of the chemical cycle to improve the efficiency of photosynthesis on the farm—for example, by altering conditions so as to give the plant longer life or to increase the yield of certain end products.

Very slight improvements in the efficiency of photosynthesis can yield tremendous returns. Plants grown on farms capture only about one percent of the sunlight that falls on them. If another percent of that sunlight could be captured and converted, the food supply would be tremendously increased.

Second, after the light conversion process is understood, some scientists say that photosynthesis factories may be built to duplicate the work of plants—to produce food synthetically, and more efficiently, and for the first time in history to liberate man from his parasitic dependence upon plants.

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BIOCHEMISTRY

Using Atomic Radiation For Foods And Drugs

➤ THE ATOMIC AGE with cheap, plentiful radiation from the wastes of atomic power plants, will see:

1. Preservation of food by cold sterilization, outmoding some canning and freezing of vegetables, meat, fruits, etc.

2. Sterilization of medical supplies, such as antibiotics, drugs and bandages, to make them safer after they are packed for shipment and use.

INSIDE JOB—A stretched rubber band usually breaks "from the inside out," General Electric researchers have found by examining high-speed photographs such as shown here. After the band has snapped, the ends fly apart at speeds up to 500 miles per hour.

3. Prevention of trichinosis, serious pork-borne disease, by irradiating hog carcasses.

4. Making bones, heart tissues and other materials from "banks" used in human replacement surgery safe for use by irradiating them with gamma rays from cobalt 60.

This was evident from reports to the International Conference on the Peaceful Uses of Atomic Energy in Geneva.

The cold sterilization of food promises to usher in as radical a revolution in food preservation as the invention of canning or heat sterilization. Profs. B. E. Proctor and S. A. Goldblith of the Massachusetts Institute of Technology told the conference ionizing radiations can destroy all sorts of microorganisms that cause spoilage in food. They can produce potatoes that can remain fresh for months and never sprout wastefully. Insects are killed by relatively mild doses of radiation, so that stray contamination is prevented.

Even the changes in color, taste and texture that sometimes occur with heavy radiation may be obviated by treating food, when it is frozen, in an inert atmosphere, or by addition of materials that would pick up the undesirable materials resulting from the radiation.

Food sterilization will come into wide use commercially within a decade, it was predicted.

Bread, rolls, cake and other bakery products will be one of the first foods to be kept fresh by atomic radiation, R. G. H. Siu, R. G. Tischer and B. Morgan of the U. S. Army Quartermaster Corps told the conference. This application will follow shortly after the waste rays are used to obviate insect damage and prevent potato sprouting.

Over 30 human patients have received successful bone grafts from the University of Michigan Hospital bone bank which sterilizes the bones on deposit there with gamma radiation. Michigan studies also show that cold radiation sterilization can treat at one time a whole load of medical supplies in tightly closed containers, replacing the present standard sterilization method using hot steam that damages many substances.

Meat that may carry trichinosis and other dangerous parasites can be made safe by use of gamma rays from cesium 137 isotope, a by-product of atomic reactors. At a cost of less than a quarter of a cent a pound, one plant, designed at the University of Michigan, could process 2,000 hog carcasses per day, obviating the danger of this disease that has forced widespread emphasis upon cooking all pork thoroughly. For trichinosis there is no successful treatment for the human victim.

Clean Up Contamination

➤ USE OF ANIMALS and fish to clean up radioactive contamination around atomic power plants was suggested by scientists of the General Electric Company working at Hanford, Wash.

STANDARDS DISPLAY—The nation's standards of length and mass are now regularly on display for the first time in the newly modified standards vault at the National Bureau of Standards in Washington. Here, Drs. Lewis V. Judson (left), chief of the length section, and A. V. Astin, director of the Bureau, prepare the platinum-iridium alloy standards.

While the dangers near Hanford have been kept to a low level, with little contamination of the Columbia River whose water is used to cool reactors, the scientists are working out methods of getting rid of the poisonous fission products in case they do get loose on a large scale, either there or at other atomic plants.

The chemicals they are most worried about are the radioactive iodine isotope 131, strontium 90 and phosphorus 32. They are formed as a consequence of "burning" of uranium or plutonium.

Crops can be contaminated either by the radioactive material falling on the maturing plants or being deposited on the soil from which it is absorbed by growing plants. Then animals eat the crops. Radioiodine loses its punch within weeks, but radiostrontium remains a potential hazard for several years.

The strontium is concentrated in the bones of animals that eat food containing it. If an area is contaminated too much, J. H. Rediske and F. P. Hungate suggested, it might be possible to feed the crops grown on it to animals, let the strontium accumulate in their bones and then sacrifice the animals and store their bones for safety.

In a similar way, fish might be used to collect and store radioactive materials until they decay and become safe, R. F. Foster and J. J. Davis proposed for unusual situations. Birds concentrated large amounts of radiophosphorus picked up from contaminated rivers and swamps in their egg yolks, skeletons and muscles.

At Hanford atomically "hot" strontium is kept in large tanks until it cools down, but this might be highly expensive for atomic power plants.

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INVENTION

Pioneer Atom Inventions Receive Patents

➤DR. ENRICO FERMI, the late Nobel Prize winner in physics, and Dr. Walter H. Zinn, director of Argonne National Laboratory, received patent No. 2,714,577 for a nuclear reactor that has a cooled shield, a composite rod for use in the reactor's active core, and a method for introducing foreign materials into the reactor's active part for neutron bombardment. At the same time, Dr. Zinn received patent No. 2,714,668 for a simple device that responds to neutrons from the reactor to act as a safety regulator.

Both inventions are an integral part of the celebrated nuclear reactor invented by Drs. Fermi and Leo Szilard that heralded the atomic age.

Patents for the early atomic inventions were applied for in 1945, and were issued ten years later. Rights for the atomic devices were assigned by their inventors to the U.S. Atomic Energy Commission.

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CHEMISTRY

Purify Atomic Fuel

➤ THE WAY to purify atomic fuel manufactured from thorium, a cheaper and more plentiful atomic source than uranium, was announced to the world by the United States at the International Conference on the Peaceful Uses of Atomic Energy.

Dr. Alan T. Gresky of the Oak Ridge National Laboratory made known the method of separating fissionable uranium 233 from the thorium 232 and the protactinium 233 from which it is converted in breeder reactors.

While it has been known that thorium, a fairly widely distributed element, can be changed by neutron bombardment into a kind of uranium that can be used for atomic power, the way of getting it separated from debris and non-burnable material has hitherto been kept secret.

First the thorium is placed like a blanket around an energy-producing core within which atomic fuel is "burning." Excess neutrons are captured by the thorium to convert it into a kind of uranium that is fissionable. The result is that 115% of the original fuel is obtained, a breeding gain of about one-seventh.

Separating this new fuel from the unchanged thorium and the fission products has been a stumbling block.

Dr. Gresky told how this can be done chemically. Nitric acid is used as a solvent and organic solutions are used to separate the uranium and the thorium. The atomic fuel is purified by ion exchange and evaporation so that it can be handled without danger of exposure to intense radioactivity from the fission products.

New Uranium Extraction

➤ NEW METHODS of recovering uranium, the atomic energy metal, from ores that cannot now be used economically were announced by Dr. George C. Marvin of the U. S. Atomic Energy Commission's division of raw materials.

Kerosene is used in one process while ion exchange resins in the form of plastic beads is used in another. Such methods are quite new to the recovery of metals from ores.

Dr. Marvin explained that as in the older processes, the first step is dissolving them with acid or alkali. The resins used are not unlike those used in large-scale commercial water-softening to remove minerals from water. In uranium concentration they seize the uranium and remove it from both clear solutions and from suspensions of solids as thick as mud.

The other new method adds unannounced chemicals to kerosene-like liquids which are agitated with the uranium solution. The atom metal transfers to the petroleum from which it is recovered easily.

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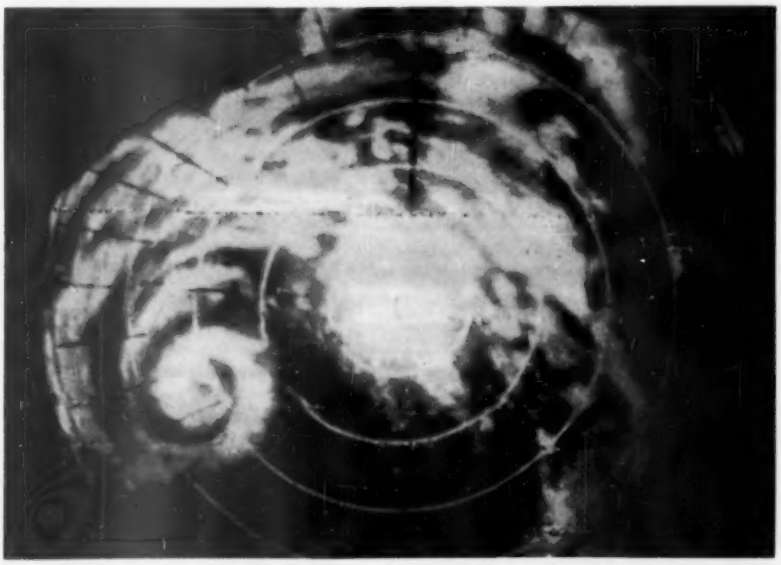


HURRICANE CONNIE—For the first time, the U.S. Weather Bureau received pictures of a hurricane by radio facsimile. This photo shows hurricane Connie as picked up at a distance of 72 miles by the new radar installed at Cape Hatteras, N. C., barely in time to start tracking the damaging tropical storm.

METEOROLOGY

Hurricane Families Take Similar Paths

➤ HURRICANES COME in families. Hurricane Diane was the second member of August's tropical storm family in which hurricane Connie was the first-born.

How many sisters hurricane families have cannot be predicted, but it is not surprising that two or more hurricanes should follow "roughly similar paths," Jerome Namias, head of the Weather Bureau's extended forecast section, said.

The more westerly paths hurricanes now seem to be taking is probably tied in with the general mildness of recent East Coast winters, he believes. This mildness has been associated with a greater-than-normal movement of air from north to south.

Since 1933, when fairly dense upper air information has been available, blocking of the normal eastward motion of hurricanes has occurred with "surprising frequency." When this occurs, Mr. Namias said, hurricanes tend to take more westerly paths.

The same pattern that caused July's heat wave over most of the northern part of the nation set the stage for the mass air movements steering early August's hurricanes.

Finding that hurricanes take roughly similar paths does not mean that where hurricanes will strike can be pinpointed days or weeks in advance, but that it is "not uncommon" for most hurricanes in a certain month or season to follow tracks usually within about 200 miles of each other.

Reason for this is that hurricanes are steered by the world-circling band of air known as the planetary wave. Important in this steering, Mr. Namias' recent studies have shown, is a high point, or ridge, in the planetary wave usually found high over northwest Canada.

As this ridge builds up to become stronger than normal, a wave pattern is set up downstream, or eastward, that captures and steers the hurricane.

The northwestern Canada ridge, 10,000 to 40,000 feet above the surface, is equalled in importance by the high point in the planetary wave found high off the north Atlantic coast. When one ridge strengthens, so does the other.

Such a strong high-level pattern, Mr. Namias said, increases the surface-level flow of air pouring southward from polar areas. Hurricane paths seem to line up just in advance of the upward-rising trough between these two high points.

Mr. Namias has also been investigating hurricane genesis. Where tropical storms are born, he believes, is also determined by the world-wide air flow patterns. Pointing out that much more research is needed, Mr. Namias said he thinks the stage is set for hurricane birth by injection of cool polar air into warm moist tropical air.

Such cold air penetrations tend to occur at the southernmost points in the troughs of planetary waves.

Science News Letter, August 27, 1955

AGRICULTURE

Huge Potato Surplus Worries U. S. Farmers

➤ AS THE nation faces an overwhelming potato surplus this year, worried farmers are asking the U. S. Department of Agriculture how they can reduce late crops already in the ground.

The latest forecast indicates that 398,715,000 bushels of Irish potatoes will be produced through the 1955 season. An estimated 340,000,000 bushels would meet all of the nation's normal needs for the year, a statistician with the Department of Agriculture told SCIENCE SERVICE.

This means the nation can expect a potato surplus of over 58,000,000 bushels this year.

There are no price supports or acreage restrictions on potatoes now, and the burden of lower prices resulting from overproduction will fall on the farmers.

In the hope of reducing their crop yield, many farmers are planning to kill off potato vines early this season, by pulling them up or treating with chemicals. Alerted by the large number of requests for information, the USDA has released a special report summarizing what it knows about the effects of early vine-killing.

According to the report based on previous years' testing, vine-killing in late producing states like Maine carried out about Aug. 25 will reduce potato output 25%, compared with possible production if the vines are left till Sept. 18. Pulling up the vines on Sept. 4 reduces the yield about 10%.

Quality of potatoes seems little impaired by early killing. In eight varieties tested, average content of solids in the potatoes was reduced less than three percent by Aug. 25 vine-killing.

Many farmers in Maine and Idaho are taking other steps to ward off price depression because of overproduction of potatoes. They have formed local, independent groups to regulate the kind and amount of potatoes that may leave their area for food. Potatoes not conforming to set standards are not allowed to go on the market, under their mutual agreement.

Science News Letter, August 27, 1955

RADIO ASTRONOMY

Find True Radio Star Of Variable Strength

➤ THREE RADIO ASTRONOMERS report discovery of a new kind of heavenly object, a true radio star, which shows rapid changes in the strength of radio waves it emits.

Radio "stars" are sources sending out radio waves picked up on earth by giant antennas called radio telescopes. More than 100 such objects are now known, many of them not identified with any visible star. Those that are known both by visible light and by radio waves are large sources, two being thought to be colliding galaxies.

The new radio star is the first observed to be of stellar size. Dr. John D. Kraus, H. C. Ko and D. V. Stoutenburg of Ohio State University announce their discovery of it in *Nature* (Aug. 13).

The object is located at the north boundary of the constellation, Hydra, the sea serpent, at a right ascension of eight hours, 19 minutes and declination of seven degrees north. So far the radio astronomers have not been able to identify the radio star with any visible star, although there are several faint stars near the radio position.

Its position is near the one at which Australian radio astronomers earlier had spotted a radio source of variable intensity.

The Ohio scientists point out that the same disturbances in the earth's atmosphere that cause stars to twinkle might cause the observed variations in intensity of radio waves from the object, picked up at 242 megacyles per second.

One reason the "marked fluctuations" in radio wave intensity are believed due to the star itself is because no correlation has been found between them and any solar or ionospheric phenomena.

The three radio astronomers have been studying the unidentified object since its unusual behavior was first noted last January. In the following months, 14 "good records" have been obtained. Four of these showed the marked changes in intensity; the remaining ten showed only a slight increase.

"If the fluctuations are intrinsic variations in the source, an explanation is that the source is a star with variable radio emission having a period of hours or days, and also a short period of a few minutes," the three scientists concluded.

Science News Letter, August 27, 1955

TECHNOLOGY

Blinker Searchlight Is Faster, Brighter

➤ A RARE GAS and a precious metal are used to make the Navy's quick-starting blinker searchlight lamps eight times brighter than present models. The lamps are used to signal between ships.

Platinum, because of its corrosion resistance, is coated on one-quarter of the new bulb's surface, forming a curved mirror. It reflects wasted rays back into the bulb, which is filled with xenon, a rare, inert gas.

As soon as the 1000-watt lamp is turned on, the xenon glows intensely, giving instantly about one-quarter of the bulb's full illumination. Heat generated by the glowing xenon heats up and vaporizes mercury in the bulb for full light power.

Use of xenon and platinum eliminates the usual warm-up period required before today's signaling searchlights can be used.

The bulb, called a short-arc mercury-xenon lamp, was developed by Westinghouse Electric Corporation in Bloomfield, N. J. Two thousand will be supplied to the Navy for converting standard blinkers.

Science News Letter, August 27, 1955

IN SCIEN

BIOPHYSICS

Atoms Give Measure Of Heart's Efficiency

➤ AN "ATOMIC" METHOD for speedy, accurate measurement of the heart's pumping efficiency and the state of its action has been developed by Dr. Rosalyn Yalow, senior physicist at the Bronx Veterans Administration hospital, New York.

Mounted on a cart, the equipment can be wheeled to the bedside of patients. It is so fast in its operation that it can record the heart actions of ten patients per hour.

A minute amount of radioactive substance is injected into a patient's blood stream. Blood from an artery then is directed into an especially designed Geiger counter, and the output of a sensitive count-rate meter is amplified so it may be viewed as a moving spot on an oscilloscope screen.

This moving spot is photographed with a recording camera to form a pattern of curves, known as the arterial dilution curves. From this strip of film, a graph of heart action can be plotted quickly to provide an accurate measurement of cardiac output.

Daniel Bibona assisted Dr. Yalow in devising the equipment. It is being used for clinical studies at the hospital by Dr. Solomon A. Berson.

Science News Letter, August 27, 1955

METEOROLOGY

"Brain" Aids Forecasts Of 1955 Hurricanes

➤ A GIANT electronic "brain" is being used for the first time this year to help track and predict hurricane motion and speed 24 hours in advance.

The weather maps resulting from millions of computations on the electronic computer are wind flow charts for the surface and at 12,000 and 20,000 feet in the atmosphere. They are not direct predictions, but are an "influence" on the final forecast, which is based on many considerations.

Dr. George Cressman, director of the Joint Numerical Weather Prediction Unit at Suitland, Md., said the computer's results for the hurricane's motion "have been working out with fair accuracy." He warned, however, against putting too much faith in the computer's calculations.

Predicting hurricane paths on the machine, he said, is difficult because "the storm's horizontal dimensions are small" compared to the general circulation. Tremendous as a hurricane's energy is, the tropical storms are nevertheless relatively little disturbances.

Science News Letter, August 27, 1955

E FIELDS

AERONAUTICS

British Study Raindrop Damage

➤ THE BRITISH have a way of studying the damage caused to the exteriors of high-speed planes when they strike raindrops in the air, D. C. Jenkins, a Royal Aircraft Establishment official, reports in *Nature* (Aug. 13).

When a plane flying at high speeds hits water drops in the air, the effect on the plane's exterior is like that of thousands of tiny, solid pellets hitting the plane with great force. The British Establishment and the U. S. Bureau of Standards have been studying this water-drop damage problem for some time.

Now the British have a way to test materials to be used for the exteriors of planes, without having to build a test plane and flying it through water in the air. A projectile of the exterior aircraft material is fired at a single drop of water, suspended on a web in the laboratory.

The projectile being tested is fired from an air pressure gun, at speeds up to 800 feet per second.

Air, pushed forward by the fast projectile, blows the web out of the way so that only the water drop hits the projectile. The projectile is then halted in a tube containing washers which "grab" the projectile and slow it down.

The head of the projectile, where the water drop struck, can then be examined for damage.

Science News Letter, August 27, 1955

NUTRITION

Fight Stirred Over Bread Wrap Material

➤ IN THE CONTROVERSY of Cellophane versus opaque waxed paper bread wrap, the American Institute of Baking, Chicago, has now taken up the cudgels in behalf of Cellophane.

The important point in the fight is how much of the B vitamin, riboflavin, is kept in the bread by its wrapper. Riboflavin is an important vitamin and one that the average person is likely to be short on. Milk is an excellent source, but few other foods are.

Consequently, when the bread enrichment program was started to make a better-fed America, riboflavin was picked as one of the vitamins that must be put into enriched white bread and flour.

Riboflavin, unfortunately, is destroyed by light. That is one reason why you are advised to protect your milk from sun and even strong daylight.

The efficiency of transparent Cellophane as protection for the riboflavin in enriched bread was challenged in a report to the Institute of Food Technologists (see SNL, July 2, p. 3). Bread wrapped in opaque waxed paper retained 30% to 60% more riboflavin than bread wrapped in Cellophane, W. H. Kanninen, director of food technology for Foster D. Snell, Inc., reported on the basis of a two-year study by his company.

Now the American Institute of Baking states tests in its laboratory and elsewhere show only very small differences in riboflavin between Cellophane and waxed paper wrapped breads. In one test the Institute reports a difference of only 2.7% riboflavin, and other figures given are of about the same range.

The Institute of Baking's report said, "Any difference between clear Cellophane ad waxed paper as a protection from vitamin loss due to light is too slight to warrant any advertising claim. In either case the loss is nutritionally insignificant."

Science News Letter, August 27, 1955

AGRICULTURE

Insecticides Can Cause Insect Pests' Increase

➤ USING INSECTICIDES can increase the number of harmful insect pests attacking an orchard, researchers at the University of California have discovered.

Where there is already control of destructive insects by their natural enemies, use of insecticides may kill off the beneficial insects and allow the pests to come back in more devastating numbers.

Testing avocado groves in Ventura County where pests were controlled by their natural enemies and where insecticides had never been used, entomologists Charles A. Fleschner and Walter Ebeling found that some chemicals killed beneficial insects while allowing pests to increase.

Following treatment with DDT and dieldrin, serious populations of avocado brown mites developed in test areas, where no problem had existed before. Dieldrin and sulfur on another area was followed by increased numbers of ammorbia and omnivorous looper and Latania scale.

After two years of insecticide treatment in the groves, treated trees now have a serious pest problem, while untreated trees are free of injurious populations.

To test the effectiveness of pest control by natural enemies, Mr. Fleschner had beneficial insects removed by hand from a series of test trees. As many as 1,400 ladybird beetles, which feed on mites, were picked off one citrus tree on a single day.

After removing its natural enemies for 60 days, Mr. Fleschner found that the citrus red mite had increased enough to seriously damage the test trees. On other trees in the grove, the natural enemies kept mites under satisfactory control.

Science News Letter, August 27, 1955

AGRICULTURE

Fooling Female Flies May Mean Victory In U.S.

➤ SCIENTISTS WERE completely successful in ridding the entire Dutch island of Curacao in the Caribbean of the once numerous and destructive cattle pest, screw-worm, by freeing sterilized male screw-worm flies on the island to frustrate the maternal longings of wild female flies.

A report from U.S. Department of Agriculture scientists said that checks made regularly since the experiment have failed to show any trace of screw-worm infestation on the island.

The success of the eradication program in Curacao now makes U.S.D.A. scientists confident that infested areas in the United States may be cleared of the pest, saving cattlemen millions of dollars annually. They are especially hopeful for the southeast cattle country. In normal winters, screw-worms in this area can only survive in Florida. If the screw-worm could be wiped out there by setting loose sterile males, the entire section would be freed of the pest.

In the eradication program, laboratory-bred screw-worm flies were sterilized by radiation from radioactive cobalt, and about 400 a week were set loose over the island. The males mate repeatedly, but females mate only once. Thus, any female mating with one of the sterile males is doomed to lay unfertile eggs. After a few months, there were no fertile males left, and the screw-worm disappeared completely.

Drs. A. W. Lindquist and E. F. Knipling and R. C. Bushland of the U.S.D.A. made the report in *Science* (Aug. 12).

Science News Letter, August 27, 1955

ARCHAEOLOGY

Evidence Found That Indians Were Cannibals

➤ A RESEARCH TEAM from the State University of Iowa has found burned and crushed human bones—some in a cooking pot—in an early Indian settlement near Cherokee, Iowa.

The bones confirm a theory that the Mill Creek Indians, probable ancestors of Sioux-speaking tribes, were cannibals.

The Indians, who are believed to have occupied this area from the thirteenth century to the seventeenth century, did not eat humans as a source of food. The cannibalism was part of a ritual.

R. J. Ruppe, director of the excavation, explained that the Indians ate captured enemy warriors. They believed that in this way they acquired the strength of the enemy's men.

The Iowa researchers have uncovered five house floors, weapons and farm tools. Food particles and bones also found show the Indians' diet included corn, beans, squash, clams, turtles, fish and deer, as well as human beings.

Science News Letter, August 27, 1955

ASTRONOMY

Cygnus Flies Overhead

The autumnal equinox, when the sun reaches the halfway mark in its southern journey, will be at 2:42 p.m. EST on Sept. 23. Sagittarius is visible in the southern evening sky.

By JAMES STOKLEY

➤ HIGH OVERHEAD on September evenings shines the constellation of Cygnus, the swan, a group also known as the Northern Cross.

At the times for which the accompanying maps are drawn (10:00 p.m., your own kind of standard time, at the beginning of September, an hour earlier at the middle of the month and two hours earlier at the end), the group stands directly at the zenith. Its bright star Deneb is toward the north, and marks the head of the cross which extends in a southwesterly direction.

But this is not the only bird to be seen among the stars, for nearby is Aquila, the eagle. This constellation is southwest of Cygnus. It contains the first magnitude star Altair, shown on the map high in the south.

A third bright star—Vega, in Lyra, the lyre—is a little to the west of Cygnus. Since Vega is the brightest star now seen in the evening sky, it is not hard to locate.

Standing high in the eastern sky, just below Cygnus, we find Pegasus, the winged horse, which contains no stars of the first magnitude although it does have a characteristic figure called the "great square," so designated on the map. The square is now seen resting on one corner.

Princess and Monster

Actually, only three of the great square's four stars are in Pegasus, for the one to the upper left as you view it in the sky is in the next-door group of Andromeda. This represents the Ethiopian princess whose story has come down to us in mythology. The hero who rescued her from the rocks to which she had been chained, left to be devoured by a sea monster, is also seen, as the constellation of Perseus, low in the northeast.

Just below and to the left of this group stands Capella, in Auriga, the charioteer, which will shine overhead during the winter months, where Cygnus is now.

Also near the horizon, over to the northwest, we find Arcturus, in Bootes, the bear-driver. It is right next to the familar great dipper, which is part of Ursa Major, the larger bear. Winding upward above this group is the snaky constellation of Draco, the dragon, part of which winds around Ursa Minor, the smaller bear. This group contains the little dipper, with Polaris, the pole star, at the end of the handle.

Cassiopeia, the queen, shaped like a letter W on one side, is to the right, between Polaris and Andromeda who, by the way, was the queen's daughter.

Low in the south is the star called Fomalhaut, in Piscis Austrinus, the southern fish. It is now seen about as well as it ever is in our northern latitudes. From more southerly countries, particularly those south of the equator, it rises high in the sky.

Planets Obscured

This is not a good month for planets. Venus and Mars are both too nearly in line with the sun to be seen easily. Mercury is farthest east of the sun on Sept. 18 and, therefore, remains above the horizon following sunset.

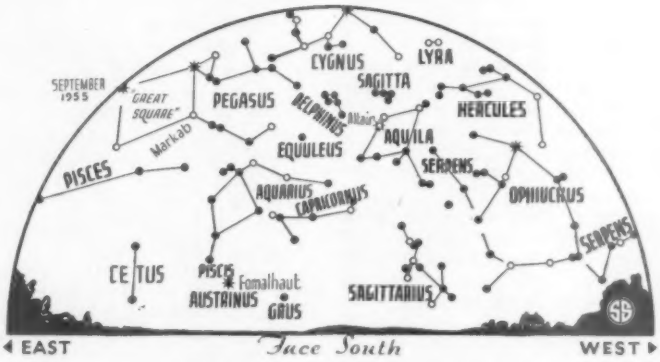
When such a position, called "greatest eastern elongation," occurs in the spring, Mercury may easily be visible in the western twilight. When, as now, it occurs in the fall, the planet is difficult to locate, since it is quite low in the sky.

However, Saturn can be seen in the southwest at dusk, setting about two hours after the sun. It is in the constellation of Libra, the scales, which is not shown on our maps since it has gone below the horizon by the times for which they are drawn.

Jupiter, so brilliant in the evening a few months ago, has now shifted to the western side of the sun and has become a morning star, visible low in the east just before sunrise.

Ever since the beginning of summer, on June 21, the sun has been moving southward in the sky. This month it reaches the halfway mark at 2:42 p.m., EST, on Sept. 23, an event termed the autumnal equinox, which marks the beginning of autumn in the Northern Hemisphere. In regions south of the equator, spring begins at the same time.

The capital of a nation is always a place of interest to its inhabitants. Likewise, the constellation of Sagittarius, now visible in the southern evening sky, ought to be of interest to us since that is the direction



☼ ✱ ○ • SYMBOLS FOR STARS IN ORDER OF BRIGHTNESS

of the center of the galaxy, our "nation" of stars, of which those we see in the nighttime sky are a small part.

The galaxy has the shape of a thin, flat watch, and contains about a hundred thousand million stars.

In addition, between the stars, there is about as much matter as there is in the stars themselves. Interstellar space is not truly empty. It is far more so than the best vacuum we can produce on earth, but there is so much of it that it can hold a great deal of material.

We are about 150 million billion miles from the center, a distance that a beam of light, traveling 186,000 miles each second, would take about 27,000 years to cover. The total diameter of the galaxy is such that light takes about a hundred thousand years to cross it.

Why the Milky Way

When we look at any direction in its plane, we see a great many more stars than when we look off to one of the sides. This vast swarm of stars seems to the naked eye to blend into a continuous band of light. This produces the effect we know as the Milky Way, the brightest part of which is in Sagittarius, where the concentration of stars is thickest.

Because we are inside the galaxy, it is hard to tell much about its general shape. However, outside its limits there are other disc-shaped aggregations of stars. Some of these, called "spiral nebulae," have a characteristic spiral structure, and it has been surmised that if an astronomer out there were to look back at us, he would see very much the same thing.

Very recently, partly with the aid of radio waves broadcast from clouds of interstellar hydrogen gas, some of these spiral arms in our galaxy have been identified, which seems to confirm this theory.

Celestial Time Table for September

Sept.	EST	
1	2:00 a.m.	Sun between earth and Venus.
2	2:59 a.m.	Full moon.
9	2:59 a.m.	Moon in last quarter.
	8:00 p.m.	Moon nearest, distance, 229,800 miles.
13	6:49 p.m.	Moon passes Jupiter.
16	1:19 a.m.	New moon.
20	11:06 a.m.	Moon passes Saturn.
23	6:00 a.m.	Moon farthest, distance 251,200 miles.
	2:42 p.m.	Autumnal equinox, sun over equator, autumn begins in Northern Hemisphere.
	10:40 p.m.	Moon in first quarter.

Substract one hour for CST, two hours for MST, and three for PST.

Science News Letter, August 27, 1955

Reclamation developments can be credited with adding about $4,000,000,000 in Federal tax revenues since 1916.

Untreated *hay fever* can lead to asthma, serious bronchial difficulties and to chronic nasal sinus infections.

GENERAL SCIENCE

Radiation Danger Halved

AEC reports chemical treatment that helps mice endure large doses of radiation and a method for obtaining temperatures nearer absolute zero than previously possible.

➤ A TREATMENT that cuts the danger of death by radiation more than half, at least for bacteria and mice, has been reported by the Atomic Energy Commission.

The mice were given chemicals before exposure and bone marrow after irradiation. They were also given streptomycin to reduce infection. With this treatment, it was possible to "more than double the amount of radiation which a mouse can survive."

The findings resulted from studies at Oak Ridge National Laboratory and elsewhere in which scientists found that bone marrow, spleen, and extracts of spleen and of yeast have a protective effect against radiation in laboratory animals and bacteria.

Certain chemicals are almost as effective as the yeast and spleen extracts in producing recovery of one strain of bacteria from radiation damage, Oak Ridge scientists found.

These chemicals are glutamic acid, uracil and guanine. By combining chemical protection before irradiation and these recovery chemicals afterwards, it was possible to make a very high percentage of bacteria resist large quantities of radiation. When nutrition and temperature conditions were right, it was possible to reduce potentially lethal damage by 50% or more. These same chemicals were effective in mice.

The recovered bacterial cells, it was also found, had a lower mutation rate than expected from the amount of radiation exposure. This suggests a relation between the reduction in mutation rate and the increase in survival produced by the chemicals. Both effects may be produced by the same protective mechanism, it appears.

The low mutation rate is called "an interesting finding" because previous experiments had indicated that mutation production depended solely on the amount of radiation to which the cell is exposed.

The findings, with their hope of leading to human application, appear in the Eighteenth Semiannual Report of the Atomic Energy Commission.

Reach Low Temperatures

➤ A UNIQUE METHOD for reaching temperatures much lower than ever before possible is also described in the report.

To learn about atoms and their hard cores, or nuclei, scientists have found it very useful to study them at temperatures as close as possible to absolute zero, 459.72 degrees below zero on the Fahrenheit scale. At this temperature, all substances or particles reach a state of frozen immobility.

Theoretically it is impossible to reach absolute zero, but scientists have devised ways of coming within a few hundredths of a degree of it. The new method now suggested by the AEC would cool the metal indium by "temperatures perhaps one-hundredth as great as those realized previously in low temperature research."

It would be reached by placing the metal indium between the poles of a magnet at a temperature below 459 degrees Fahrenheit, then later cuting off the magnetic field. Under these conditions the neutrons and protons that make up its hard core tend to line up in one direction, that of the applied magnetic field.

When such nuclei revert to a random arrangement, they should absorb energy from the motion of the atoms. Since temperature is simply a measure of the energy state—the higher the temperature, the greater the energy—absorption of the nuclear energy would lower the metal's temperature.

What is now needed, the AEC said, are "advances in techniques to increase the degree of polarization," or alignment, of nuclei. Experiments at Oak Ridge National Laboratory are aimed in this direction.

Science News Letter, August 27, 1955

More than half of the *drugs* in use today were unknown 17 years ago.

A *tree*, shaded and protected from wind by other trees in the woods, may easily blow over or suffer from sunscald in winter when suddenly left to stand alone.

GOLF: Your LEFT SHOULDER makes the amazing difference!

One of the most startling discoveries to emerge from wide research in the golf swing is that your game literally **hinges on your left shoulder!**

How this is so and how to use this great discovery to improve your own game beyond all expectations **in a matter of short weeks** is set forth in **THE GOLF SECRET** by Dr. H. A. Murray—a medical doctor, golfer, and golf researcher, who has applied his expert knowledge of anatomy in this sweeping and utterly different study of the golf swing.

His method has now been tested on a large scale and been found to yield simply astounding results! Not only do golf scores take a sudden drop, but with the new method good golf is a hundred times **easier** than bad—because it is **NATURAL** (not **strained**) golf.

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• Books of the Week •

For the editorial information of our readers, books received for review since last week's issue are listed. For convenient purchase of any U. S. book in print, send a remittance to cover retail price (postage will be paid) to Book Department, Science Service, 1719 N Street, N.W., Washington 6, D. C. Request free publications direct from publisher, not from Science Service.

ANTI-COMPOSITION TABLES FOR CARBON COMPOUNDS (CH, CHO, CHS & CHOS)—Compiled by H. H. Hatt, T. Pearcey and A. Z. Szumer—*Cambridge University Press*, 191 p., $4.00. To help chemists recognize and analyze unknown organic chemical compounds of high molecular weight and to express them as formulas.

BASIC PROCESSES OF GASEOUS ELECTRONICS—Leonard B. Loeb — *University of California Press*, 1012 p., illus., $13.50. Planned not only as a textbook, but also for the benefit of the engineer or physicist who is not familiar with the field of gaseous electronics.

CHEMICAL ENGINEERING COST ESTIMATION—Robert S. Aries and Robert D. Newton—*McGraw-Hill*, 263 p., illus., $6.00. Intended to help the engineer give management the economic perspective on a given project.

THE CHEMISTRY AND FERTILITY OF SEA WATERS—H. W. Harvey—*Cambridge University Press*, 224 p., illus., $5.50. A study of the sea as a setting for plant and animal life, showing the effect plants and animals have upon sea water composition.

CHILDREN CAN MAKE IT: Experience in the World of Materials—*Association for Childhood Education International*, Reprint Service Bulletin No. 28, 56 p., illus., paper, 75 cents. Objects that children in elementary school would find fascinating, as well as educational, to make for themselves.

CLIMATES IN MINIATURE: A Study of Micro-Climate and Environment—T. Bedford Franklin—*Philosophical Library*, 137 p., illus., $3.75. Telling how beasts, birds, plants and even humans react to their local climates and environments.

CURRENT PRACTICE IN THE DEVELOPMENT OF MANAGEMENT OF PERSONNEL—M. J. Dooher, Ed.—*American Management Association*, Research Report No. 26, 35 p., paper, $1.75. Setting forth certain fundamental principles of management development of interest to executives concerned with this aspect of management education.

DEFEAT AT SEA: The Struggle and Eventual Destruction of the German Navy, 1939-1945—C. D. Bekker—*Holt*, 222 p., illus., $3.95. Written by a former German naval officer.

ELECTRO-TECHNOLOGY: Basic Theory and Circuit Calculations for Electrical Engineers—M. G. Say—*Philosophical Library*, 167 p., illus., $6.00. Giving in concentrated form a guide to the handling of circuit problems for two-terminal and four-terminal cases, and for balanced and unbalanced three-phase cases.

EXPERIMENTAL ELECTRONICS FOR THE BEGINNER: Part I Electronic Components and Fundamental Circuitry—Lewis G. Blevins and Leonard R. Crow—*Universal Scientific Co.*, 360 p., illus., paper, $3.50. Exercises dealing with the fundamentals of electronic components and electronic circuits.

EXPERIMENTAL PSYCHOLOGY: A Series of Broadcast Talks on Recent Research—B. A. Farrell, Ed.—*Philosophical Library*, 66 p., $2.75. To acquaint the reader with some recent work by psychologists.

FIFTY YEARS A SURGEON—Robert T. Morris—*New American Library*, 237 p., paper, 35 cents. Autobiography of a surgeon. Originally published by E. P. Dutton in 1935.

HEALTHFUL LIVING—Harold S. Diehl with foreword by Morris Fishbein—*McGraw-Hill*, 4th ed., 529 p., illus., $6.00. Resistance against disease requires healthful living, which means adequate nutrition, rest, exercise, cleanliness, and freedom from mental stress.

THE HOME GARDENING ENCYCLOPEDIA—*Philosophical Library*, New ed., 366 p., illus., $6.00. A reference book for the gardener who wishes to grow flowers, vegetables or fruits.

HOW TO DRAW IN 3RD DIMENSION—David Gordon—*William-Frederick*, 14 p., illus., paper, $2.00. Simplified instructions for the beginner.

THE METALLURGY OF ZIRCONIUM—Benjamin Lustman and Frank Kerze Jr., Eds.—*McGraw-Hill*, 776 p., illus., $10.00. Presenting an account of the occurrence, reduction, refining, properties and uses of zirconium and zirconium alloys.

OUTDOOR HAZARDS: Real and Fancied—Mary V. Hood—*Macmillan*, 227 p., illus., $3.95. A guide to outdoor safety, telling how to distinguish between genuine hazards of the outdoors and imaginary ones that can be dispelled by understanding their nature.

PALEOZOIC AND MESOZOIC ROCKS OF GROS VENTRE, TETON, HOBACK, AND SNAKE RIVER RANGES, WYOMING—Harold R. Wanless, Ralph L. Belknap, and Helen Foster—*Geological Society of America*, Memoir 63, 90 p., illus., $2.75. The rocks discussed here display a remarkably long and nearly complete stratigraphic column.

PET ALLIGATORS—Carl F. Kauffeld—*All-Pets*, 24 p., illus., paper, 35 cents. The author is the curator of reptiles at the Staten Island Zoo.

POPULAR FINCHES—George W. Noreen—*All-Pets*, 24 p., illus., paper, 35 cents. Telling of the many varieties of this species and showing how most of them can be raised in captivity.

ROME BEYOND THE IMPERIAL FRONTIERS—Sir Mortimer Wheeler—*Philosophical Library*, 192 p., illus., $7.50. Recent discovery has increased our knowledge of the amazing spread of Roman relics being found from Ireland to China. Written by the professor of Roman archaeology at the University of London.

SOIL WARMING BY ELECTRICITY — R. H. Coombes—*Philosophical Library*, 116 p., illus., $4.75. Providing information on the installation of soil-warming equipment for greenhouse, cold-frame and cloche, and discussing those crops which benefit most by soil warming.

YOUR PET COCKATIEL—Alice L. Sadler—*All-Pets*, 24 p., illus., paper, 35 cents. The author, who breeds Cockatiels, gives useful information for owners of these birds.

YOUR PET DOG—Gabrielle E. Forbush—*All-Pets*, 24 p., illus., paper, 25 cents. Giving hints on choosing, raising and training a dog.

Science News Letter, August 27, 1955

The supply of *pork* in the United States for consumption in 1955 is estimated at 66.5 pounds per person.

Pygmies are monogamous, the social unit being the family with the father as the chief; the families form clans governed by the elders.

PUBLIC SAFETY

Objects on Shoulder Cause Cars to Veer

➤ VEHICLES PARKED on highway shoulders make drivers veer to the left, sometimes over the center line. This is true even though the cars or trucks do not protrude onto the road.

As a rule, motorists do not slow down when they speed by a car, truck or barricade on the shoulder. The narrower the road, the more they swerve, highway engineer Asriel Taragin reports in *Public Roads* (June). On a two-lane highway, 16-feet wide, cars veered 3.3 feet from the shoulder, while on a 24-foot road, the shift was only 1.8 feet.

Cars traveling in the lane closest to the shoulder are the only ones affected, the study showed. Objects two feet from the pavement had half the effect of those right at the edge. At six feet there is a negligible shifting. On a four-lane highway a barricade had only half the effect of a truck.

Trucks generally veer farther than autos. Motorists make the greatest shift toward the center line when there is no obstructing traffic. But drivers meeting a truck or bus coming the other way were found to stay closest to the shoulder.

Three feet is the minimum adequate clearing distance for cars passing in opposite direction, Mr. Taragin said. But the research, conducted in cooperation with the Oregon State Highway Department, showed that 30% of the passenger cars on two-lane highways with a 24-foot surface had a clearance of three feet or less, when an object was placed on the shoulder.

On roads with 11-foot lanes, the corresponding figure was 46%. An object on the shoulder of roads with eight-foot lanes caused 94% of passing cars to come closer than three feet to oncoming traffic, with an average clearance of only 1.3 feet between cars.

Science News Letter, August 27, 1955

PHYSIOLOGY

Malayan Holds World's Record for Taste Sense

➤ THE WORLD'S RECORD for the most acute sense of taste for any substance is held by a Malayan Negrito youth belonging to the Kintak Bong division of Negritos and living in the State of Kedah, Federation of Malaya.

In tests with the very bitter substance, phenylthiocarbamide, or phenylthiourea, this lad was able to detect the taste when the substance was diluted to a weaker point than has ever been detected before in taste tests with this and other taste-test substances, such as quinine.

The record-breaking sense of taste is reported by Dr. J. W. H. Lugg of the University of Malaya, Singapore, in *Nature* (Aug. 13).

Science News Letter, August 27, 1955

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OCEANOGRAPHY

Deep-Sea Explorers Get Guide to Naming Finds

➤ EXPLORERS of the ocean depths have been turning up so many new peaks, ridges, basins, seamounts and other underwater landmarks that naming them all has become a major problem in the flourishing science of oceanography.

Wading into the problem, the British National Committee on the Nomenclature of Ocean Bottom Features has come forth with a list of 15 rules to guide the deep-sea pioneers in naming their finds in a systematic manner.

The first rule holds that no feature should be named without adequate reason.

If the new find must be named, then wherever possible it should be linked with some geographical area, such as the "Aleutian Basin," for a basin found near the Aleutian Islands. Explorers should avoid calling their discoveries after personal or ship names, reserving these for items like deep soundings of the ocean floor.

A description of undersea bodies can often be given by using paired names. Thus, the name Atlantic-Antarctic Ridge shows at a glance the extent and location of the structure. The first part of the name should designate either the western or northern end of the body.

The number of names can often be cut by using the same label for nearby structures: Aleutian Ridge, Aleutian Basin, and Aleutian Trench.

If this system of undersea naming is adopted, the old "law of priority," which says that the first name given a structure must be held to, will be tossed overboard where the old label does not fit the new rules.

John D. H. Wiseman and Cameron D. Ovey report the Committee's recommendations in *Deep-Sea Research* (1955, Vol. 2).

Science News Letter, August 27, 1955

AGRICULTURE

Chemical Controls Parasitic Weed

➤ CHEMICAL ATTACK is proving effective in controlling the parasitic weed, dodder, a major pest in alfalfa fields of the West and especially troublesome to alfalfa seed growers.

Spraying with the chemical herbicide CIPC just as alfalfa begins to grow in the spring delays dodder sprouting by about a month, the U. S. Department of Agriculture reports. This delayed sprouting, in turn, cuts the number of dodder plants that grow to maturity, form seeds and reinfest the fields the following year. Holding back the emergence of dodder also nets a better alfalfa seed crop.

Dodder is a parasitic weed which fastens itself to helpless host plants, devouring their nutrient materials.

Science News Letter, August 27, 1955

BOTANY

NATURE RAMBLINGS

by Horace Loftin

These Funny Fruits

➤ A SINGLE, shriveled corn kernel is every bit as much a fruit as the largest, juiciest Delicious apple. Acorns can also claim this title, as well as pods of peanuts, cucumbers, coconuts and blackberries.

What is it that the members of such an unlikely assortment have in common that makes botanists recognize them all as fruits?

First of all, each of these different fruits bear one or more seeds which contain the embryos of future plants. Now, in the flower the seeds are found in a small structure called the ovary. So, among all plants bearing flowers, the "fruit" is basically a transformed and ripened ovary containing seeds.

The part we like to eat in a succulent apple is really food material stored in the altered, ripening ovary of the apple blossom, which surrounds and protects the seeds found in the core. This is the basic pattern of a fruit, but many fruits differ in "design" from this picture.

For instance, with the corn kernel, the only sign of the ovary is a thin, hard coat which is tightly bound to the seed. Still, the presence of this bit of ovary coat is enough to make botanists class a kernel of corn as a true, single-seeded fruit.

Berries show interesting variations of fruit structure. Those like the blackberry, with many small "globes" on each berry, come from a single flower bearing several ovaries. Each of the globes of the berry represent one of these ovaries. Incidentally, tomatoes come from flowers with compound ovaries.

The part of the strawberry that we enjoy eating is not actually the "fruit," but is the enormously enlarged base of the flower (receptacle). The true fruits are embedded throughout the receptacle as the tiny "seeds."

Mulberries have yet another structure. They are formed from clusters of individual flowers, and each of the mulberry "globes" represents the fruits of a separate flower.

Science News Letter, August 27, 1955

PSYCHOLOGY

Predict Mental Break Of Brainwashed GIs

➤ MEN returning from Korean POW camps are likely to suffer mental breakdown or at least show psychiatric symptoms in the future.

This prediction comes from Drs. Peter S. Santucci and George Winokur of Washington University School of Medicine. They made it in the American Medical Association's *Archives of Neurology and Psychiatry* (July).

Chinese Communist brainwashing is expected to play a part in producing the mental sickness symptoms.

They suggest a brainwashing in reverse as treatment for returnees showing symptoms of mental sickness. By this treatment, the returnee would be rewarded and given reinforcement for behavior acceptable to American society.

"Brainwashing," the psychiatrists points out, "is not merely a method of indoctrination."

It is a process which can produce abnormal human behavior by setting up internal conflicts with accompanying anxiety and confusion.

The intensity of the conflict between ideas absorbed in Korean POW camps and American thinking may result in more psychiatric problems in Korean returnees than in a comparable group from German and Japanese POW camps of World War II.

The desire to avoid such a conflict may be the reason some prisoners chose to remain in China, the psychiatrists think.

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Questions

BIOCHEMISTRY—Where do birds concentrate radioactive material? p. 134.

□ □ □

MEDICINE—For what experiments is Pavlov well known? p. 130.

□ □ □

METEOROLOGY—What may be the reason for the more westerly course of hurricanes in recent years? p. 135.

□ □ □

PHYSICS—How many tons of granite are necessary to produce releasable energy equivalent to 10 to 15 tons of coal? p. 132.

□ □ □

PSYCHOLOGY—What is "brainwashing?" p. 142.

□ □ □

Photographs: Cover, Urs G. Arni; p. 131 Westinghouse Electric Corporation; p. 133, General Electric Company; p. 134, National Bureau of Standards; p. 135, U.S. Weather Bureau; p. 144, Bausch & Lomb Optical Company.

ENTOMOLOGY

Grain Pest Season Here

➤ THE PEAK SEASON is here for devastation of stored grains by one of the most prolific and destructive insect pests in the country, the khapra beetle.

A U. S. Department of Agriculture expert told SCIENCE SERVICE he had seen a bin of barley, 100x40x14 feet, completely ruined by these tiny pests, which were only discovered in this country in 1953. In another bin, he saw khapra beetle larvae and cast-off skins one foot deep.

Since its successful eradication in New Mexico, the khapra beetle is believed to be bottled up in California and Arizona, where it continues to strike at stored barley and grain sorghum with disastrous results. Worried entomologists, however, are appealing to farmers and grain storage men to keep watching for the pest and to report its occurrence in an effort to keep it from spreading.

The khapra beetle, native of India, Ceylon and Malaya, has already spread from Japan, the Philippines, and Australia, to England, Europe and Africa. Although only found here in 1953, some astute detective work by the USDA indicates that it must have gotten into the Fresno area of California as early as 1946.

The insect belongs to the same family as carpet beetles and resembles them. It can be spotted in grain storage facilities by the presence of fuzzy larvae or cast-off skins, about one-eights of an inch long, in clusters around the corners of grain bins or in used sacks. Like rice and granary weevils, it attacks sound kernels of grain.

The only effective remedy for the khapra beetle is to cover infested bins with a tarpaulin and fumigate thoroughly. Fumigation will not hurt the grain for use as feed, the USDA said.

Anyone who thinks he has discovered khapra beetles in stored grains should send specimens to: Insect Identification and Parasite Introduction Section, U.S. Department of Agriculture, Beltsville, Md. Specimens should be placed in rubbing alcohol in a leakproof jar or vial. Do not send live specimens through the mail.

Science News Letter, August 27, 1955

AGRICULTURE

Germ-Resistant Plants

➤ MAN'S FIGHT against famine is netting startling victories, as new weapons pour forth from atomic laboratories and plant breeding stations that are putting resistance to diseases right into the hereditary make-up of his food crops.

Scientists from all over the country heard of the revolutionary progress in reports given to the American Society of Agronomy meeting in Davis, Calif.

Use of atomic particle radiation to induce hereditary changes in plants that leave them immune to certain diseases was reported by Dr. Calvin Konzak of the Brookhaven National Laboratory.

In his experiment, Dr. Konzak exposed oat seeds to radiation from an atomic reactor. The variety of oats he used was known to be highly susceptible to the fungus disease, helminthosporium blight.

He planted the seeds and, after they had sprouted, inoculated them with the destructive fungus.

Several of the plants from radiation-exposed seeds were resistant to the fungus disease. This resistance was found to be passed on to the offspring of the disease-immune oat plants, showing that the atomic radiation had done its beneficial work by changing the heredity of the plants.

In another experiment to breed disease-fighting power into plants, the high, inheritable resistance to leaf rust of a wild relative of domestic wheat has been transformed to the wheat plant itself, reported Dr. Ernest R. Sears, geneticist with the U.S. Department of Agriculture.

The wild "wheat" used was a member of the goatgrass family, Aegilops umbellulata, which is practically immune to leaf rust. Since it was impossible to cross the goatgrass directly with domestic wheat, Dr. Sears crossed it first with an intermediate plant, emmer wheat. The offspring of these two could then be crossed successfully with common wheat, with the disease resistance being passed on to the resulting hybrid.

The new rust-resistant wheat strains are still far from ready for commercial use, Dr. Sears said. The task of combining the rust resistance with other desirable qualities in a single variety of wheat still lies ahead for plant breeders.

While many plant breeders are looking for naturally-occuring or induced hereditary changes as a source of new and better varieties, Jack R. Harlan of the U.S. Department of Agriculture and Oklahoma A & M College told the A.S.A. meeting that more effort should be spent exploring in foreign countries for plants with the desired qualities already in existence.

Nearly all of the forage crops in the United States were imported here from somewhere else Mr. Harlan pointed out. In bringing them here we have brought only a very small and very restricted sample of the many variations that exist, he said.

As an example, orchard grass in the United States now is restricted in use because of lack of heat and drought tolerance. But in Mediterranean countries there are forms of this grass that prosper with less than eight inches of rainfall a year.

More progress in improving hereditary qualities might be made more quickly and at less expense by introducing these old-world forms than by conventional breeding programs based on current limited samples he said.

Science News Letter, August 27, 1955

BIOCHEMISTRY

Seek Clues to Inborn Errors in Body and Mind

➤ CERTAIN INBORN errors in body chemistry cause deviation from normal processes, leading to mental deficiency and other ailments is being studied by Dr. Max Dunn, University of California at Los Angeles biochemist, and others aided by grants from Swift and Company.

One such deviation results in inferior mental ability and is known as phenylketonuria. It is the result of a faulty processing of the amino acid phenylalanine.

Another instance in which body chemistry veers from the normal is a rare condition known as alcaptonuria, characterized by marked discoloration of excretory products. Key to the condition is homogentisic acid, which is being structurally explored by the group.

"It is only by scrutinizing these chemical errors in minute detail," Dr. Dunn pointed out, "that we can spot where body chemistry turned left when it should have turned right. From such information can be devised means of correcting harmful deviations in life processes."

Associated with Dr. Dunn in the research have been Howard Wolkowitz, Bernard Kaufman and Machio Yuchida.

Science News Letter, August 27, 1955

TECHNOLOGY

Flame-Proofing for Cotton Perfected

➤ A FLAME-PROOFING TREATMENT for cotton materials, much superior to previous methods, has been developed jointly by the U. S. Department of Agriculture scientists and the Army Quartermaster Corps' research branch.

A combination of two chemicals that up to now were used separately for flame-proofing cotton are employed in the new technique. In the treatment, one part of BAP, or bromoform-allyl-phosphate, is added to two parts of THPC-resin solution, or tetrakis (hydroxymethyl) phosphonium chloride, and applied to the cloth, which is then dried and heat-cured. The process increases the weight of the cloth about 18%, but shows little effect on other fabric qualities. The flame-proofing holds up well under both laundering and dry cleaning.

Science News Letter, August 27, 1955

• New Machines and Gadgets •

For sources of more information on new things described, send a self-addressed stamped envelope to SCIENCE SERVICE, 1719 N St., N.W., Washington 6, D. C., and ask for Gadget Bulletin 793. To receive this Gadget Bulletin without special request each week, remit $1.50 for one year's subscription.

⚙ *HAIR BRUSH, dubbed "self-cleansing," has openings in its plastic back which permit water to flow through, removing much of the dirt that ordinarily collects. The brush is very light, but quite strong. Its handle is contoured to fit the hand comfortably.*

Science News Letter, August 27, 1955

⚙ *MIXER PITCHER has a hinged cap to close the pouring spout in the cover for mixing frozen fruit juices, milk shakes and malts. The cap also makes the pitcher ideal for storing milk and other beverages that should be kept in closed containers. The plastic pitcher is available in several colors with white trim.*

Science News Letter, August 27, 1955

⚙ *MOBILE CABINETS for offices, homes and schools have interchangeable parts, thus can be changed into many different units with only a Phillips screw driver. Coated with protective plastic coatings, the wood cabinets are available in several pastel shades with gray.*

Science News Letter, August 27, 1955

⚙ *CINEMASCOPE LENS, as shown in the photograph, newly designed for 16 mm. projectors, will make possible the showing of the wide-screen productions in military, church, school and other small theaters*

that do not have 32 mm. equipment. Major studios plan to release 16 mm. CinemaScope prints in the near future.

Science News Letter, August 27, 1955

⚙ *CORK-SCREW PINS, with a twist, lock slip covers, antimacassars, auto seat covers and such onto upholstered furniture or car seats. A back twist releases the pin. Their attractive heads are made of ivory or crystal-like plastic.*

Science News Letter, August 27, 1955

⚙ *PORTABLE X-RAY unit permits user to load, expose and develop X-ray films in daylight. Made of a tough plastic, the unit is for use with a portable X-ray generator to spot hidden flaws in bridge girders and construction welding. With the processing unit, 24 films can be used and developed on the spot.*

Science News Letter, August 27, 1955

⚙ *TIE CLASP is actually part of a hidden hearing aid. The tiny instrument is inconspicuously held behind the wearer's shirt by the gold-plated clip. The unit's efficiency and small size are made possible by transistors, used in place of tubes.*

Science News Letter, August 27, 1955

⚙ *BARBECUE SABERS, of stainless steel with cane handles, look like dueling sabers but are made for spearing food, not humans. With these stylish sabers, which are sold in sets of four, you can add interest to the preparation of barbecue food from shishkebab down to the lowly hot dog.*

Science News Letter, August 27, 1955

Do You Know?

A rapid and simple method to detect *morphine* in body fluids and tissues has been found.

In 1956, the U. S. Fish and Wildlife Service will survey the amount of time and money spent annually by American *sportsmen* on hunting and fishing.

Each swept-back wing of a modern *jet* bomber contains 14,698 bolts and rivets, some with tolerances as small as 0.0015 of an inch.

The auto travel boom is resulting in more traffic deaths this year, but on a deaths-per-mile basis, the *highways* are the safest they have ever been.

There are 85 oil wells and 78 gas wells capable of production and 35 wells are drilling on the Outer Continental Shelf in the Gulf of Mexico.

The American *shrimp* industry, most lucrative of all commercial fishing enterprises, produces about 225,000,000 pounds of shrimp annually, valued at $50,000,000.

Viruses are being studied by ripping them lengthwise down the center, by dissolving away specific components, by centrifugally separating light and heavy parts, by freezing and drying, and by new microscopic and photographic techniques.

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